Refracting telescope

A refracting telescope consists of two converging lenses. The first lens (the *objective* lens) forms a small real image within the focal length of the second lens (the *ocular* lens). Looking through the ocular lens, a magnified virtual image of the real intermediate image can be observed.

Task:

a) The object is so far from the telescope that the incoming light rays are essentially parallel. Construct the image of the far away arrow which is formed by the first lens (focal points F_1) using the technique of ray tracing. Use different colors for the top (dotted line) and the bottom (solid line) of the arrow.
Is the image real or virtual? Is it upright or upside down?

b) Construct the image of the intermediate image which is formed by the second lens (focal points F_2) using the technique of ray tracing. Again use different colors for the top and the bottom of the arrow's image.
Is the image real or virtual? Is it upright or upside down?

Microscope

A microscope consists of two converging lenses. The first lens (the *objective* lens) forms a magnified real image within the focal length of the second lens (the *ocular* lens). Looking through the ocular lens, a magnified virtual image of the real intermediate image can be observed.

Task:

a) Construct the image of the far away arrow which is formed by the first lens (focal points F_1) using the technique of ray tracing. Use different colors for the top and the bottom of the arrow. Is the image real or virtual? Is it upright or upside down?

b) Construct the image of the intermediate image which is formed by the second lens (focal points F_2) using the technique of ray tracing. Again use different colors for the top and the bottom of the arrow's image.
Is the image real or virtual? Is it upright or upside down?